Substorm Expansion Phases During Magnetic Storms in April 17-23, 2002: IMAGE FUV Observations

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Three magnetic storms occurred during April 17-23, 2002 as an important SEC effect driven by several solar flares and CMEs. FUV auroral data from the IMAGE spacecraft have ~85% coverage for the double main phases of the second magnetic storm that occurred during April 19-20, and have 57% coverage for the main phase of the third magnetic storm that occurred on April 23. During the second storm, when the IMF Bz was strongly southward, north - south auroras, auroral torches and double auroral ovals occurred within substorm expansion phases. Simultaneously, observations of energetic particles at the geosynchronous altitude showed the feature of "sawtooth injections" at every substorm expansion onset. During the third storm, when the IMF Bz was mainly in a strong northward direction, the first auroral expansion onset occurred ~12 min after an intense interplanetary shock arrived at the nose of the magnetopause. There were no energetic particle injections or electrojets observed at the geosynchronous orbit or by CANOPUS magnetometers for this auroral expansion onset. FUV data showed auroral poleward expansion, but mainly within the midnight sector. There might be two substorm expansion phases that occurred at the middle and near the end of the storm main phase. Comparison studies between the two magnetic storms and between the observations from space and the ground will be performed to better understand the storm-substorm relationship.